

Focus on Research

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Update on Research: Unmanned Aircraft Systems (UAS)

NHDOT partnered with the University of Vermont Spatial Analysis Lab to investigate the potential for using UAS technology to enhance the transportation sector. The objective of this research project is to determine what the types of transportation-related projects that UAS are best suited for and to evaluate the associated capability, limitation, and cost/benefit. ([INFO](#))

Working with several stakeholders throughout the Department, a list of case studies was established to evaluate the applicability of UAS for a variety of NHDOT activities. Examples that have been undertaken include:

- accident reconstruction
- aeronautics
- construction monitoring
- traffic monitoring
- rail and bridge inspections
- rock slope inspections

Information obtained by UAS methods will be compared to that provided by conventional methods to determine the advantages/disadvantages of each.

The collage features eight case study cards, each with a title, a brief description, and a 'PROJECT OVERVIEW' section. The cards include:

- Accident UAS Case Study:** NH Motor Speedway - Loudon, NH. Focuses on determining an accident's cause and location.
- Rock Slope UAS Case Study:** Crawford Notch State Park. Focuses on identifying rockfall hazards.
- Aeronautic UAS Case Study:** Jaffrey Airport - Jaffrey, NH. Focuses on accident reconstruction.
- Rail & Bridge UAS Case Study:** Lancaster, NH. Focuses on inspecting bridges and rail infrastructure.
- Construction UAS Case Study:** 14633B Project - Derry & Windham, NH. Focuses on monitoring construction progress.
- Traffic Monitoring UAS Case Study:** I-95 - Portsmouth, NH & Pawtucket State Park. Focuses on monitoring traffic volume and congestion.

 Each card also lists 'DATA PRODUCTS', 'UAS BENEFITS', and 'CONSIDERATIONS'.

Principal Investigator: UVM Professor Jarleth O'Neill-Dunne

Limited Reuse Soil (LRS) — AASHTO Sweet 16 Winner

Limited Reuse Soils (LRS) include roadside soils, as well as “street wastes” (ditching materials, catch basin clean outs, and street sweepings). It’s not an issue to NHDOT unless EXCAVATED during construction or collected during maintenance operations. Based on data identified from other state departments of transportation, roadside soils are known to typically contain concentrations of regulated compounds above naturally occurring background concentrations, and therefore, have limited reuse potential.

We learned that LRS may be encountered in all topsoil adjacent to roadway surfaces. In instances where topsoil is not present, LRS can be expected to be encountered in soil from the top of ground to a depth of six inches. Handling this material is expensive. The less material we handle, the less material required to be disposed of, the less financial impact and also better for the environment.



NHDOT has received a waiver from NH Dept. of Environmental Services for the management of "de minimis Limited Reuse Soils (LRS) generated through projects of limited scope (including guardrail installation, grubbing, etc.) provided the soils generated or disturbed by these activities are not destined for off-site reuse by NHDOT or other parties".

The final report, [Mildly Contaminated Soil Distribution Assessment](#), September 2017, focuses technical guidance for Polycyclic Aromatic Hydrocarbons (PAHs) in LRS. The sources and concentrations of PAHs is discussed along with its desorption characteristics. **Principal Investigator:** Sanborn Head & Associates, Inc.

Laboratory vs. Plant Produced Test Specimens (High RAP/RAS)

This study includes testing on both binder and asphalt mixtures with a wide variety of variables including fabrication method (laboratory vs. plant), aggregate size and gradation, binder PG grade and source, and recycled materials’ type and content. The final report, [Correlation Between Laboratory and Plant Produced High RAP/RAS Mixtures](#), July 2016, shows that stiffness-based characteristics of the binders that included recycled pavement correlate well between the laboratory-made mixes and the material from the field production plant. When considering cracking parameters, test results on the pavements containing recycled pavement was not well correlated between lab mixes and plant mixes.

NHDOT can use the results knowing that the continued use of RAP is a wise way to recycle old pavement. However, additional work is needed to fully understand how the aging of the residual binder from the recycled pavement impacts the resistance to cracking of the new asphalts.

Principal Investigator: UNH Professor Jo Sias Daniel, Ph.D., P.E.



State Transportation Innovation Council (STIC) Incentive Program

2017 Project Progress

Most recently, the Department has partnered with the City of Dover to help NHDOT respond to AASHTO's Signal Phasing and Timing (SPaT) **Challenge**. NH is the only state in New England to date actively participating in this deployment.



CHANGE Champions are benefiting from the ongoing two dimensional (2D) hydraulic models for two Department projects. Improved representations of changes in riverine or coastal environments can be created to potentially avoid or minimize the impacts on transportation assets.

Our on-call consultant, HDR Inc., continues the effort on developing the Department's Design - Build Accelerated Project Delivery Manual chapters.

2018 Projects

The selected projects for 2018, along with the recipients, are as follows:

- Innovative Green Infrastructure Restoration and Resiliency Approaches for Linear Transportation – UNH Stormwater Center
- Mobile Construction Project Management (small scale – local municipality) – City of Manchester
- Keeping up with Innovation adding FTIR and XFR Capability to the Toolbox Funds – Materials Section NHDOT M&R
- High Resolution Rock Slope 3D mapping – Geotechnical Section NHDOT M&R

Every Day Counts (EDC) Round 4

At the EDC4 Summit, the Department set an implementation goal and committed to finding opportunities to get the innovations into practice.

The innovations selected included:

- Automated Traffic Signal Performance Measures (ATSPMs)
- Ultra-High Performance Concrete (UHPC)
- Collaborative Hydraulics: Advancing to the New Generation of Engineering (CHANGE)
- e-Construction and Partnering: A Vision for the Future
- Using Data to Improve Traffic Incident Management

The next round of EDC innovations will be announced later this Fall. The EDC-5 Summit will provide the venue for selection of the Department's next innovation participation and potential implementation.



NH Partners in Research - NETC Update

The New England Transportation Consortium (NETC) is a research cooperative between the state DOTs of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

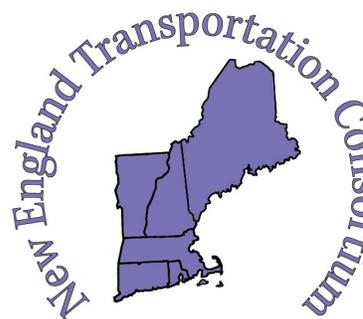
The 2018 NETC program includes the following research projects:

- Development of MASH (Manual for Assessing Safety Hardware) Computer Simulated Steel Bridge Rail & Transition Details (Lead State/Technical Advisory Committee (TAC) Chair, Maine/Jeff Folsom)
- Framework of Asphalt Balanced Mix Design for New England Agencies (Lead State/TAC Chair, New Hampshire/Denis Boisvert)
- Integration/Incorporation of Unmanned Aircraft Systems (UAS) into state DOTs (Lead State/TAC Chair, Massachusetts/Jeffrey DeCarlo)

During a recent program review, the NETC Advisory Committee voted in favor of accepting Quick Response research topics that could be completed in six months and cost less than \$50,000.

Three projects are underway a various stages:

- Quality Assurance (QA) Processes for Asphalt Pavement Construction in the Northeast
- Quantification of Research Benefits
- New England Connected/Autonomous Vehicles



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“If we knew what we were doing, it would not be called research, would it?”

- Albert Einstein
(1879-1955)
Physicist
Nobel Prize 1921

New Hampshire
DOT
Department of Transportation

Deirdre Nash joins the NHDOT Research Section

Deirdre Nash brings a variety of engineering experience to her position as Assistant Research Engineer at NHDOT. A licensed professional engineer with a background in structural and geotechnical engineering, Ms. Nash has been with NHDOT for nine years in the NHDOT Pavement Management section.



“As a new member of the research team, I am inspired by what I have learned about the research work being done to explore improvements to transportation engineering. I look forward to drawing from my educational, private sector, and state experiences to enhance the individual research projects and the program as a whole.”

Have a research need? Contact the Research Section